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Which of the recommended home exercises for low back pain is easier to learn and remember?

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Abstract

Aim: In this study, we aimed to evaluate learning time and remembering of the exercises given as a home exercise program for low back pain patients.

Material and Methods: The study included patients aged 20-65 years who suffered from mechanical low back pain. All patients were informed about the study and informed consent was obtained from each of them. A socio-demographic form probing age, gender, and educational status was filled in by the patients. All the patients were taught five exercises, which were aimed at increasing trunk and lower extremity muscle length, strength, and endurance by the same physiotherapist and the exercises were repeated by the patients in the presence of the physiotherapist until they were performed fully and appropriately. In the meantime, the total number of repetitions and the duration of learning the exercises (seconds) were noted for each patient. Patients were instructed to perform these exercises for 15 days with 10 sets a day. At a 15-day follow-up session, patients were asked to perform the assigned exercises, and those who performed them correctly were recorded as "remembering".

Results: Patients learned the hamstring stretch, lumbar stretch, and flexor stretch in a shorter period and learned the hamstring stretch with fewer repetitions compared to other exercises. Additionally, the lumbar stretch was the most remembered exercise.

Discussion: We suggest that instead of giving patients multiple complex exercises, patient-specific exercises that can be easily learned and performed without forgetting can be selected, and thus lumbar stretch is a suitable option for this purpose.

Keywords

Low Back Pain, Home Exercise Program, Time, Remember, Repetition

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Introduction

Therapeutic exercise is defined as bodily movement prescribed to correct an impairment, improve musculoskeletal function, or maintain an optimal state of well-being. The importance of exercise in low back pain treatment has increased over recent years, and this importance was first emphasized in a study conducted in 1964 [1].

Low back pain, which peaks between the ages of 40-80, is a common health problem [2]. Common drugs prescribed for the pharmacological treatment of low back pain include nonsteroidal anti-inflammatory drugs, muscle relaxants, opioids, benzodiazepines, antidepressants, acetaminophen, systemic corticosteroids and pregabalin or gabapentin, Therapeutic exercise is a primary non-pharmacological treatment [3]. Moreover, it speeds up recovery and facilitates early return to work [4].

Therapeutic exercises are given as a home exercise program or as a component of physical therapy. Often, patients find it difficult to understand and remember the exercises [5, 6]. Expectedly, the exercises are not fully learned and remembered, and thus difficult to perform. There are many factors that affect learning and remembering. Although there have been many studies on exercise efficiency and compliance, to our knowledge, there has been no study investigating the duration of learning home exercise programs and the extent to which these programs were correctly remembered by patients who were assigned to perform home exercises.

The aim of this study was to analyze the duration of learning and the extent of remembering the exercises in patients who were assigned to perform home exercises and compare these parameters with patients' educational status and age in order to help develop patient-based strategies in exercise training.

Material and Methods

The Ethics Committee of Harran University approved this study. Written informed consent was obtained from all participants. The study included patients aged 20-65 years who had been suffering from mechanical low back pain for at least 12 weeks. Patients with vision, hearing, comprehension problems, neurological and orthopedic deficits in the lower extremities were excluded from the study. All patients were informed about the study and informed consent was obtained from each of them. The patients filled in a socio-demographic form probing age, gender, and educational status. Patients were divided into three groups according to their educational status: (i) below high school level, (ii) high school level, and (iii) university level. All patients were taught five exercises, which were aimed at increasing trunk and lower extremity muscle length, strength, and endurance by the same physiotherapist, and the exercises were repeated by the patients in the presence of the physiotherapist until they were performed fully and appropriately. In the meantime, a total number of repetitions and the duration of learning the exercises (seconds) were noted for each patient. Patients were instructed to perform these exercises for 15 days with 10 sets a day. At a 15-day follow-up session, patients were asked to perform the assigned exercises, and those who performed them correctly were recorded as "remembering". On the same day, the total number of repetitions made and the total duration of time, (seconds) spent learning the exercises and the extent of remembering these exercises were recorded for each patient.

Exercises

Hamstring Stretch reduces the load on the disc and paraspinal muscles by relaxing the hamstrings. When one knee is in flexion and the other leg is in extension, the subject attempts to touch the tip of the toe of the extended leg with the hand. When tension is experienced in the hamstrings, they are loosened and the same procedure is repeated.

Anterior Pelvic Tilt strengthens the back muscles. The subject lies on his/her back with the knees in flexion. The pelvic bone is lifted upwards by contracting the gluteus muscle. After waiting for five seconds, the subject returns to the initial state.

Posterior Pelvic Tilt strengthens the abdominal and gluteal muscles, resolves muscle spasms, and corrects lordosis. The subject lies on his/her back with the knees and hips in flexion. The abdominal muscles contract for five seconds and then relax to ground the low back. While the low back is pressed to the floor, the hips are slightly lifted off the ground and then relax.

Lumbar Stretch increases flexibility by resolving the spasm of the paravertebral muscles. When lying on the back and pulling the knees into the chest with the help of hands, the subject attempts to touch the knees with the forehead.

Flexor Stretch reduces lumbar lordosis. In the supine position, one knee is pulled towards the chest, while the other leg is press towards the ground

Ethical Approval

Ethics Committee approval for the study was obtained.

Results

Among 69 patients, 39 (56.5%) were women and 30 (43.5%) were men. No significant difference was found among the three groups with regard to gender distribution (p=.770). The mean age was 46.71±11.42 (range, 20-65) years and no significant difference was found among group I, II, and III with regard to mean age (48.50±1.77, 45.00±3.03, and 40.45±1.66 years respectively) (p=.094).

Table 1 presents the duration of learning (seconds), the number of repetitions, and the extent of remembering for each exercise. The results indicated that the patients learned the hamstring stretch, lumbar stretch, and flexor stretch in a shorter period and learned the hamstring stretch with fewer repetitions compared to other exercises. Additionally, the lumbar stretch was the most remembered exercise.

At the 15-day follow-up session, 28.98% of the patients remembered all the exercises correctly. Table 2 provides the distribution of patients who correctly remembered all the exercises according to gender, age, and educational status. The mean age of patients that remembered all the exercises correctly was significantly lower than that of patients who did not (p=.000). It was also noted that the university graduates remembered all exercises significantly better than other patients (p=.000). However, no significant difference was found in terms of gender (p=.332).

Table 3 presents a comparison of patients' duration of learning and their educational status. The comparison indicated that university graduates learned all five exercises in a significantly

Table 1. Duration, number of repetitions, and extent of remembering (Second=sec).

	Duration of learning (sec)	Repetitions of learning	Remembering		Not-remembering	
			n	%	n	%
Hamstring Stretch	22.46±13.27	2 (1-3)	54	78.2%	15	21.8%
Anterior Pelvic Tilt	28.40±11.92	4 (1-5)	42	60.8%	27	39.2%
Posterior Pelvic Tilt	28.18±12.74	4 (1-5)	43	62.3%	26	37.7%
Lumbar Stretch	20.43±10.24	3 (1-4)	64	92.7%	5	7.3%
Flexor Stretch	20.55±10.71	3 (1-4)	45	65.2%	24	34.8%

Table 2. The extent of remembering according to socio-demographic characteristics.

	Remember (n=20)	Not-Remembering (n=49)	p
Age (years)	37.70±1.73	50.38±1.52	0.000
Gender			
Female	10	29	0.332
Male	10	20	
Educational status			
Lower than high school (48)	8	40	0.000
High school (10)	3	7	
University (11)	9	2	

Table 3. Comparison of the duration, repetition of learning and memory in patients by their educational status.

	Lower than High School (n=48)	High School (n=10)	University (n=11)	p
	Median (minimum-maximum)	Median (minimum-maximum)	Median (minimum-maximum)	
Hamstring stretch	20 sec	20 sec	10 sec	0.004
	(10-60)	(10-60)	(10-30)	
Anterior pelvic tilt	30 sec	25 sec	20 sec	0.000
	(10-60)	(10-30)	(10-30)	
Posterior pelvic tilt	30 sec	20 sec	20 sec	0.000
	(10-70)	(10-30)	(10-30)	
Lumbar stretch	20 sec	20 sec	15 sec	0.372
	(10-45)	(10-60)	(10-30)	
Flexor stretch	20 sec	20 sec	10 sec	0.004
	(10-45)	(10-60)	(10-20)	
Repetitions of Learning				
Hamstring stretch	2	2	1	0.054
	(1-3)	(1-3)	(1-3)	
Anterior pelvic tilt	2	1	2	0.000
	(1-5)	(1-2)	(1-2)	
Posterior pelvic tilt	2	1	2	0.001
	(1-5)	(1-2)	(1-2)	
Lumbar stretch	2	1	1	0.949
	(1-4)	(1-2)	(1-2)	
Flexor stretch	2	1	1	0.006
	(1-4)	(1-2)		
Remember\Not- Remember				
Hamstring stretch	37\11	8\2	9\2	0.713
Anterior pelvic tilt	23\25	8\2	11\0	0.001
Posterior pelvic tilt	25\23	7\3	11\0	0.003
Lumbar stretch	43\5	10\0	11\0	0.156
Flexor stretch	29\19	6\4	10\1	0.087

shorter time compared to other patients (p=.004, p=.000, p=.000, and p=.004, respectively).

A significant difference was found among the three groups with regard to the number of repetitions performed for learning anterior pelvic tilt, posterior pelvic tilt, and flexion stretch (p=.000, p=.001, and p=.006, respectively). It was noted that patients with an educational level lower than high school education learned these exercises with more repetitions (Table 3).

On the 15-day follow-up session, all university graduates remembered the anterior pelvic tilt, posterior pelvic tilt, and lumbar stretch correctly. Additionally, all high school graduates remembered lumbar stretch correctly as opposed to 89.5% of the patients with an educational level lower than high school education. Moreover, the lumbar stretch was the most remembered exercise. It was also found that patients with an educational level lower than high school education remembered the anterior pelvic tilt and posterior pelvic tilt significantly less

than other patients (p=.001 and p=.003, respectively) (Table 3).

Discussion

The present study, for the first time in the literature, analyzed the duration of learning and the extent of remembering the exercises in patients assigned to perform home exercises and found that the lumbar stretch and the flexor stretch were learned and remembered in a shorter time compared to other exercises. We also observed that university graduates showed better performance compared to other patients in terms of duration of learning, number of repetitions, and the extent of remembering. Selecting exercises that can be easily understood and performed by the patients is as important as selecting appropriate exercises for each patient.

The choice of exercise for low back pain depends on the preference of the patient and the therapist and also on the cost and safety of the exercises [7]. Home exercise programs typically consist of exercises that can be performed by patients in their social environment. Prior to implementation, the patients were mostly instructed by a physiotherapist about the number of repetitions and the total duration of the exercise. Sometimes they may be provided with exercise brochures or even audio or video recordings of the exercises [8].

Weakness in the back extensor and flexor muscles was reported in patients with low back pain [9]. Accordingly, patient-specific stretching and strengthening exercises constitute the most important part of the treatment. However, only properly performed exercises contribute to the effectiveness of the treatment. The effectiveness of exercise programs for low back pain has been shown in numerous studies [10, 11]. However, there is little or no data on which exercise is more effective for low back pain. Most of the studies available in the literature have compared stabilizing exercises with various types of exercises and found that all of these exercises reduce pain and that the exercises are not superior to each other [12-17].

Isolated lumbar stabilization exercises have been shown to have positive effects on pain [18]. Moreover, it was shown that isokinetic and standard exercise programs have no superiority over each other [19].

Most of the studies investigating home exercise programs have evaluated patient compliance rather than the effect of these programs. A previous study evaluated the adherence of the patients to home exercise programs and factors affecting adherence and revealed that 39% of the patients showed full adherence to home programs and also found a significant relationship between adherence and parameters such as age, environmental motivation, understanding of the exercises, physiotherapist's explanation quality, control and assessment of home exercises by the physiotherapist, and patient's trust in the physiotherapist [5]. Another study reported that the compliance rate was 9%, 73%, and 18% in patients aged 15-25, 26-44, and 45 years and older, respectively. The authors also noted that fatigue, forgetting or avoiding exercises, lack of time for the exercises, and the belief that exercises were not beneficial all negatively affected patient compliance [20].

Campbell et al. reported that their patients' initial compliance with the home exercise program decreased over time [21]. In another study investigating compliance with home exercise programs, patients were given three exercises and brochures, and the results indicated that there was 71.6% compliance with the exercises regardless of gender [10]. In contrast, another study found that women showed less compliance with the exercise program compared to men [22]. Despite these conflicting results, we did not observe any difference between the two genders in terms of duration of learning and the extent of remembering.

Rastall et al. compared young and old patients with regard to the capacity for remembering and performing home exercises and suggested that although the elderly forgot the exercises more, the rate of forgetting was also high in young people and thus brochures should be given to all patients [6]. In our study, the mean age of the patients who did not remember the exercises was higher than that of patients who remembered them correctly, which could be due to the adverse effect of degenerative changes in the brain and neurons caused by an age-related decrease in cerebral blood flow on the cognitive functions such as learning, memory, and problem-solving. [23]. Based on these findings, we also suggest that patients aged over 50 years should be given longer education and should be provided with visual or auditory support.

Peek et al. reported that only 16.6% of the patients remembered the exercises correctly [24]. In our study, 28.98% of the patients remembered all five exercises correctly, whereby the most remembered exercise was a lumbar stretch (92.7%) and the least remembered exercise was anterior pelvic tilt (60.8%). Accordingly, we suggest that the lumbar stretch, which is the most important exercise in terms of relaxing the paravertebral muscles, provides significant relaxation, thus, patients should take utmost care to remember this exercise.

Our study was limited since the patients' social environment prevented them from exercising, their psychological conditions were not evaluated, and the study included a small sample of patients.

Conclusion

In conclusion, the results indicated that educational status and age are important factors affecting the duration of learning and the extent of remembering home exercises, and that patients had difficulty particularly in learning and remembering the anterior pelvic tilt and posterior pelvic tilt. Additionally, the lumbar stretch was the most remembered exercise, mainly because patients experienced greater relaxation after this exercise.

We suggest that instead of giving patients multiple complex exercises, patient-specific exercises that can be easily learned and performed without forgetting can be selected, and thus lumbar stretch is a suitable option for this purpose. Additionally, when assigning multiple exercises to patients aged over 50 years, the exercises should be clearly explained by the physiotherapist within a minimum period of 30 seconds with at least 5 repetitions, and also audio or video support should be provided.

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Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content

including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement
All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest
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References
1. Woodhead BH, Fowler JR. The Dynamic Treatment Of The Low Back Strain Syndrome. Can Med Assoc J. 1964;90(20):1152-5.
2. Hoy D, Brooks P, Blyth F, Buchbinder R. The Epidemiology of low back pain. Best Pract Res Clin Rheumatol. 2010;24(6):769-81.
3. Qaseem A, Wilt TJ, McLean RM, Forciea MA, Clinical Guidelines Committee of the American College of Physicians, Denberg TD, et al. Noninvasive Treatments for Acute, Subacute, and Chronic Low Back Pain: A Clinical Practice Guideline From the American College of Physicians. Ann Intern Med. 2017;166(7):514-30.
4. Kamper SJ, Apeldoorn AT, Chiarotto A, Smeets RJ, Ostelo RW, Guzman J, et al. Multidisciplinary biopsychosocial rehabilitation for chronic low back pain: Cochrane systematic review and meta-analysis. BMJ. 2015;18:350-444.
5. Chan D, Can F. Patients' adherence/compliance to physical therapy home exercises, Fizyoterapi Rehabilitasyon/ Physiotherapy Rehabilitation. 2010;21(3):132-9.
6. Rastall M, Brooks K, Klarneta K, Moylan N, McCloud W, Tracey S. An Investigation into Younger and Older Adults' Memory for Physiotherapy Exercises. Physiotherapy. 1999;85:3.
7. Saragiotto BT, Maher CG, Yamato TP, Costa LO, Menezes Costa LC, et al. Motor control exercise for chronic non-specific low-back pain. Cochrane Database Syst Rev. 2016; 2016(1):CD012004.
8. Salik Sengul Y, Kaya N, Yalcinkaya G, Kirmizi M, Kalemci O. The effects of the addition of motor imagery to home exercises on pain, disability and psychosocial parameters in patients undergoing lumbar spinal surgery: A randomized controlled trial. Explore (NY). 2021;17(4):334-9.
9. Bayramoğlu M, Akman MN, Kilinç S, Cetin N, Yavuz N, Ozker R. Isokinetic measurement of trunk muscle strength in women with chronic low-back pain. Am J Phys Med Rehabil. 2001;80(9):650-5.
10. Kolt GS, McEvoy JF. Adherence to rehabilitation in patients with low back pain. Man Ther. 2003;8(2):110-6.
11. Durmus D, Unal M, Kuru O. How effective is a modified exercise program on its own or with back school in chronic low back pain? A randomized-controlled clinical trial. J Back Musculoskelet Rehabil. 2014;27(4):553-61.
12. Suh JH, Kim H, Jung GP, Ko JY, Ryu JS. The effect of lumbar stabilization and walking exercises on chronic low back pain: A randomized controlled trial. Medicine (Baltimore). 2019;98(26):e16173.
13. Oh YJ, Park SH, Lee MM. Comparison of Effects of Abdominal Draw-In Lumbar Stabilization Exercises with and without Respiratory Resistance on Women with Low Back Pain: A Randomized Controlled Trial. Med Sci Monit. 2020;26:e921295.
14. Sipaviciene S, Kliziene I. Effect of different exercise programs on non-specific chronic low back pain and disability in people who perform sedentary work. Clin Biomech (Bristol, Avon). 2020;73:17-27.
15. Shamsi MB, Rezaei M, Zamanlou M, Sadeghi M, Pourahmadi MR. Does core stability exercise improve lumbopelvic stability (through endurance tests) more than general exercise in chronic low back pain? A quasi-randomized controlled trial. Physiother Theory Pract. 2016;32(3):171-8.
16. Koumantakis GA, Watson PJ, Oldham JA. Trunk muscle stabilization training plus general exercise versus general exercise only: randomized controlled trial of patients with recurrent low back pain. Phys Ther. 2005;85(3):209-25.
17. Moon HJ, Choi KH, Kim DH, Kim HJ, Cho YK, Lee KH, et al. Effect of lumbar stabilization and dynamic lumbar strengthening exercises in patients with chronic low back pain. Ann Rehabil Med. 2013;37(1):110-7.
18. Hadała M, Gryckiewicz S. The effectiveness of lumbar extensor training: local stabilization or dynamic strengthening exercises. A review of literature. Ortop Traumatol Rehabil. 2014;16(6):561-72.
19. Sertpoyraz F, Eyigor S, Karapolat H, Capaci K, Kirazli Y. Comparison of isokinetic exercise versus standard exercise training in patients with chronic low back pain: a randomized controlled study. Clin Rehabil. 2009;23(3):238-47.
20. Soukayna M, Hassane KE, Hassan K, Hassan H. Patient's adherence to prescribed home exercises: Barriers and interventions. Genet Mol Res. 2018;17 (1). DOI: 10.4238/gmr16039898
21. Campbell R, Evans M, Tucker M, Quilty B, Dieppe P, Donovan JL. Why don't patients do their exercises? Understanding non-compliance with physiotherapy in patients with osteoarthritis of the knee. J Epidemiol Community Health. 2001;55(2):132-8.
22. Engström LO, Oberg B. Patient adherence in an individualized rehabilitation programme: a clinical follow-up. Scand J Public Health. 2005;33(1):11-8.
23. Fjell AM, Walhovd KB. Structural Brain Changes in Aging: Courses, Causes and Cognitive Consequences. Rev Neurosci. 2010;21(3):187-221.
24. Peek K, Carey M, Mackenzie L, Sanson-Fisher R. Patient adherence to an exercise program for chronic low back pain measured by patient-report, physiotherapist-perception and observational data. Physiother Theory Pract. 2019;35(12):1304-13.

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